THE REMARKS

Claims 1-20 were pending prior to entering the amendments.

The Amendments

New Claim 21 is supported by original Claim 13.

New Claim 22 is supported by original Claim 14. and page 3, lines 1-2.

New Claim 23 is supported by page 16, lines 23-24 and Figure 1.

All the other amendments are to correct antecedent basis or to clarify the meaning of the claims.

No new matter is introduced in any of the above amendments. The Examiner is requested to enter the amendment and re-consider the application.

Claim Objections

Claims 1, 7, 8, 10, and 15-18 are objected to because of informalities.

Claims 15-16 are cancelled. The other objected claims have been amended to correct the informalities.

35 U.S.C. § 112, Second Paragraph, Rejection

Claims 1, 3-6, 10, 11, 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 13-14 are cancelled. The other rejected claims have been amended to correct the alleged indefiniteness.

35 U.S.C. § 102(b) Rejections

1. Claims 1-9, 12, 13, 15 and 17-20 are rejected under 35 U.S.C. 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tsai, et al.

Claims 3, 13, 15, and 20 are cancelled. The rejection to the remaining claims are traversed.

Claim 1

Claim 1 is directed to a process for preparing Y-branched carbon nanotubes (CNTs) comprising the steps of: (a) loading a catalyst on a CNT carrier; (b) pre-treating the catalyst-loaded CNTs to have the catalyst bonded to the surface of the CNTs; and (c) performing a synthetic reaction of new CNTs using the pretreated CNTs from step (b). The technical characteristic of the present invention lies in using the already obtained CNTs as a carrier, loading the CNT carrier with a catalyst and pre-treating the catalyst-loaded CNTs to have the catalyst bonded tightly to the surface of the CNTs, and synthesizing new CNTs to have the new CNT branches growing from the bonded catalyst particles on the original CNT carrier. (see Publication at Paragraph [0014])

Tsai does not use pre-existing CNTs as a carrier, and does not go through a pre-treatment stage to bind a catalyst to CNTs. In addition, Tsai does not disclose the step of synthesizing Y-branched CNTs using the pretreated CNTs that are bonded with a catalyst.

In particular, Tsai discloses a process for synthesizing CNTs on a Pd catalyst loaded Si substrate by MPE-CVD method with flowing CH_4 and H_2 gas mixture (page 1900, last paragraph to page 1901, first paragraph).

As can be seen from Fig. 3 of Tsai, Tsai performs CNT synthesis after loading the Pd catalyst on the substrate (step (a) of Fig. 3 of Tsai), whereas the instant claims use already synthesized CNTs as a carrier (step (a) of present claim 1).

Thus, the preparation process of Tsai which synthesizes upside-down Y-shaped CNTs on a Si substrate by merging the growing CNTs through a well-known MPE-CVD method is completely different from the preparation process of the present invention which synthesizes Y-branched CNTs by loading the catalyst on a 'CNT carrier' and using the pre-treated catalyst-loaded CNTs themselves as a whole catalyst.

Therefore, Claim 1 and it dependent claims 2, 4-9, 12, and 17-19 are not anticipated or obvious over Tsai.

In particular, Claims 6, 9 and 19 are further different from Tsai for the following reasons.

Claim 6

Claim 6 recites that the step of loading a catalyst is carried out by impregnation,

precipitation, sol-gel method, chemical vapor deposition, sputtering, evaporation, dispersing method or spraying method.

The examiner states that Tsai uses nanocrystalline Pd as the catalyst, and comprises the step of loading a catalyst carried out by chemical vapor deposition (CVD).

Contrary to the examiner's rejection, the nanocrystalline Pd catalyst of Tsai is not loaded by CVD, but the catalyst is loaded by immersing the Si substrate in the $PdCl_2$ aqueous solution and reducing it, and the catalyst surface is activated by treating it with hydrogen plasma. The MPE-CVD method is used by Tsai when synthesizing CNTs after the above step (Tsai, page 1900, last paragraph 2 to page 1901, first paragraph 1). Therefore, Tsai does not disclose Claim 6.

Claims 9 and 19

The examiner states that Tsai discloses the synthetic reaction performed using a suspension in which the catalyst-loaded carbon nanotubes are dispersed in a solvent (ethanol), and thus Claims 9 and 19 are anticipated from Tsai.

In this regard, TSAI, page 1901, paragraph 1, line 11~18 discloses as follows: "The grown carbon nanotubes for TEM analysis were separated from the substrate and then ultrasonicated in ethanol. After ultrasonic treatment, a drop of liquid was then sprayed onto a carbon-coated copper grid." Tsai uses CNT suspension dispersed in ethanol for preparing a TEM analysis sample by placing the synthesized CNTs on the copper grid.

In contrast, Claims 9 and 19 use colloidal solution as a method for synthesizing Y-branched CNTs. To be more specific, the claims relate to synthesizing CNTs by dispersing catalyst-loaded CNTs in a solvent and using the solvent itself as a carbon source during CNT synthesis (paragraphs [0034]-[0038], and [0045], Example 5).

Thus, Tsai's step for preparing the synthesized Y-shaped CNTs as a TEM analysis sample is completely different from the colloidal solution for CNT synthesis of Claims 9 and 19.

For the reasons stated above, Claims 1-2, 4-9, 12, 17-19 are not anticipated by or obvious over Tsai.

2. Claims 13 and 15 are rejected under 35 U.S.C. 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Li, et al. (US 6,325,909 B1).

Claims 13 and 15 are cancelled.

3. Claims 13-16 are rejected under 35 U.S.C. 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ting, et al. (US 2003/0118727 B1).

Claims 13-16 are cancelled.

35 U.S.C. § 103(a) Rejection

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Tsai, et al. as applied to Claims 1 and 9 above, and further in view of Kishi, et al. (US 6,869,581 B2).

Kishi discloses preparing electrode structure or nanodevice by (i) providing particulate metal having an oxidation catalytic action on a substrate, (ii) contacting the particular metal on the substrate with a hollow graphene sheet material comprising a CNT, and (iii) heating it in an oxygen atmosphere to partly cut the CNT only at the part the metal is provided, and making a shape (Kishi, Claim 1, col.2, line 55-62, col. 3, line 17-26, col. 5, line 18-22). Thus, Kishi differs from the preparation process of the present invention in constitution.

The description of Kishi, stated by the examiner to correspond to the present claims, relates to a method of uniformly disposing CNTs on the substrate by making a CNT dispersed solution comprising a solvent and surfactant, spraying it and removing the solvent (Kishi, col. 8, line 20-28, line 50-67, col. 9, line 11-12). This only corresponds to the step of (ii) contacting the particular metal of the substrate with a CNT above.

In contrast, the present invention synthesizes CNTs by injecting a dispersion liquid to the reactor, and uses it as a carbon source. The above description of Kishi is similar to the present invention only in that a dispersion of CNTs comprising a solvent and a surfactant is used, but it differs in steps applied and in purpose, and thus the present invention is different from Kishi.

As discussed above, Claim 1 and its dependent claims are not obvious over Tsai, et al. The addition of Kishi does not cure the deficiency of Tsai. Therefore, the 103(a) rejection of Claims 10 and 11 over Tsai and Kishi should be withdrawn.

CONCLUSION

Applicants believe that the application is now in good and proper condition for allowance. Early notification of allowance is earnestly solicited.

Respectfully submitted,

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